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INTERIM GUIDELINES – March 22, 1999

“SOLAS” Lifejacket Light

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1 Scope

“SOLAS” lifejacket lights must meet the requirements of, and be tested and approved under these guidelines.

7 Approval Procedure

Lifejacket lights are approved by the Coast Guard under the procedures in Subpart 159.005 of this chapter.

(a) Pre-approval review

The pre-approval review application submitted to the Commandant under 159.005-5 of this chapter must include preliminary plans covering the arrangement and construction of the lifejacket light.

(b) Approval tests

The approval inspection and tests under section 27 must be conducted by an independent laboratory accredited by the

Coast Guard under Subpart 159.010 of this chapter.

(c) Final application

At the conclusion of the testing, the manufacturer must submit the test report, plans, and quality control procedures required under 159.005-9(a)(5) of this chapter. In order to be considered complete, the final plans under 159.005-12 of this chapter must include:

(a) the general arrangement or top assembly drawing;

(b) drawings of each component and subassembly made specifically for the lifejacket light;

(c) bills of material or parts lists identifying hardware, materials, and other purchased parts and components;

(d) sufficient additional detail necessary to determine that each requirement of these guidelines is met; and

(e) the maintenance and training material under section 31.

15 Construction

(a) The lifejacket light must be designed to be attached to the upper shoulder area of a lifejacket or immersion suit.

(b) The lifejacket light may be powered by a water-activated or dry cell battery.

(1) The battery must be of a type that will not deteriorate due to dampness or humidity.

(2) The storage life of the battery must be twice as long as the period between its date of manufacture and its expiration date. The storage life is considered to be the amount of time after its date of manufacture that the battery can be stored under typical environmental conditions on a vessel and still have sufficient power to pass the test in section 27.

21 Performance

Each lifejacket light must meet the performance standards of section 2.2.3 of the International Life-Saving Appliance Code (LSA Code). [See enclosure \(1\).](#)

23 Marking and labeling

All marking and labeling must be in the English language. Marking and labeling in additional languages is permitted. The lifejacket light must be permanently and indelibly marked with:

- (a) Name of manufacturer.
- (b) Model designation.
- (c) U.S. Coast Guard approval number.

(d) Date of manufacture and date of expiration of the battery.

27 Approval inspections and test

Lifejacket lights must pass the tests in section 10.3 and 10.4 of the International Maritime Organization's Recommendation on Testing of Life-Saving Appliances ([see enclosure \(2\)](#)).

31 Training and maintenance material

The manufacturer must make training material and maintenance material available to purchasers of Coast Guard approved lifejacket lights. These must be submitted to the Commandant (G-MSE-4) for approval with the final plans under 159.005-12 (a)(4) of this chapter. The training material and the maintenance material must each consist of a page or pages suitable for insertion into a loose leaf binder, or else the material provided to the lifejacket manufacturer for inclusion in their manuals. These materials must be in the English language. Materials including additional languages are permitted.

(a) The training material must contain instructions and information on operating the lifejacket light. The material must be in easily understood terms, illustrated wherever possible.

(b) The maintenance material must consist of information on how to install, check, care for, and repair the lifejacket light. This should include a description of the battery or light expiration dating, as well as an explanation as to whether or not the light is "disposable", or one that has a replaceable battery. The battery or light replacement process should be explained, along with how the light should be examined and tested during lifesaving equipment inspections. Simple repairs, if possible -- such as bulb replacement -- should also be covered.

INTERNATIONAL LIFE-SAVING APPLIANCE (LSA) CODE

PREAMBLE

1 The purpose of this Code is to provide international standards for life-saving appliances required by chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974.

2 On and after 1 July 1998, the requirements of this Code will be mandatory under the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. Any future amendment to the Code will be adopted and brought into force in accordance with the procedure laid down in Article VIII of that Convention.

2.2.3 Lifejacket lights

2.2.3.1 Each lifejacket light shall:

- .1 have a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere;
- .2 have a source of energy capable of providing a luminous intensity of 0.75 cd for a period of at least 8 h;
- .3 be visible over as great a segment of the upper hemisphere as is practicable when attached to a lifejacket; and
- .4 be of white colour.

2.2.3.2 If the light referred to in paragraph 2.2.3.1 is a flashing light it shall, in addition:

- .1 be provided with a manually operated switch; and
- .2 flash at a rate of not less than 50 flashes and not more than 70 flashes per minute with an effective luminous intensity of at least 0.75 cd.

INTERNATIONAL MARITIME ORGANIZATION
Recommendation on TESTING OF LIFE-SAVING APPLIANCES
as amended through resolution MSC.81(70), December 1998

10 POSITION-INDICATING LIGHTS FOR LIFE-SAVING APPLIANCES

10.3 Lifejacket light tests

10.3.1 Twelve lifejacket lights should be subjected to temperature cycling as prescribed in 1.2.1.

1.2.1 The [lights] should be alternately subjected to surrounding temperatures of -30°C and +65°C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for a total of 10 cycles, is acceptable:

- .1 an 8 h cycle at +65°C to be completed in one day; and*
- .2 the specimens removed from the warm chamber that same day and left exposed under ordinary room conditions until the next day;*
- .3 an 8 h cycle at -30°C to be completed the next day; and*
- .4 the specimens removed from the cold chamber that same day and left exposed under ordinary room conditions until the next day.*

10.3.2 After at least ten temperature cycles, four of these lifejacket lights should be taken from a stowage temperature of -30°C and then be operated immersed in seawater at a temperature of -1°C. Four should be taken from a stowage temperature of +65°C and then immersed in seawater at a temperature of +30°C and four should be taken from ordinary room conditions and operated immersed in freshwater at ambient temperature. Water-activated lights should commence functioning within 2 min and have reached a luminous intensity of 0.75 cd within 5 min in seawater. In fresh water a luminous intensity of 0.75 cd should have been attained within 10 min. At least 11 out of the 12 lights, which should all be of white colour, should continue to provide a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere for a period of at least 8 h.

10.3.3 One light attached to a lifejacket should be subjected to a drop test as prescribed in 2.9.6. The light should not suffer damage, should not be dislodged from the lifejacket and should function as prescribed in 10.3.2.

2.9.6 Without readjusting the lifejacket, the test subject should jump vertically into the water, feet first, from a height of at least 4.5 m. When jumping into the water, the test subject should be allowed to hold on to the lifejacket during water entry to avoid possible injury. The freeboard to the mouth should be recorded after the test subject comes to rest.

10.3.4 One light should be dropped from a height of 2 m onto a rigidly mounted steel plate or concrete surface. The light should not suffer damage and should be capable of providing a luminous intensity of not less than 0.75 cd for a period of at least eight hours when operated immersed in freshwater at ambient temperature.

10.3.5 In the case of a flashing light it should be established that:

- .1 the light can be operated by a manual switch;
- .2 the rate of flashing is not less than 50 flashes and not more than 70 flashes per minute; and
- .3 the effective luminous intensity is at least 0.75 cd (see 10.4).

10.4 Common Tests for All Position Indicating Lights (additional lights are required to carry out the environmental tests.)

10.4.1 Vibration Test

Regulations: IEC 945 :3rd edition (November.1996), paragraph 8.7

Test Procedure

One unit shall be subjected to a vibration test according to IEC 945 :3rd edition (November.1996), paragraph 8.7.

Acceptance Criteria

The lights shall function after the test.

10.4.2 Mould Growth Test

Regulation: LSA Code 1.2.2.4

Test Procedure

One unit should be subjected to the mould growth test defined as follows:
(Note: The mould growth test may be waived where the manufacturer is able to produce evidence that the external materials employed will satisfy the test.)

The light shall be inoculated by spraying with an aqueous suspension of mould spores containing all the following cultures:

Aspergillus niger;
Aspergillus terreus;
Aureobasidium pullulans;
Paecilomyces variotii;
Penicillium funiculosum;
Penicillium ochro-chloron;
Scopulariopsis brevicaulis;
Trichoderma viride.

The light shall then be placed in a mould growth chamber which shall be maintained at a temperature of $29\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ and a relative humidity of not less than 95 %. The period of incubation shall be 28 days. After this period the light shall be inspected.

Acceptance Criteria

The light shall be rot-proof and not be unduly affected by fungal attack.

There shall be no mould growth visible to the naked eye and the light shall function after the test.

10.4.3 Switch Arrangement Test

Test Procedure

One unit shall be subjected to the switch arrangement test.

A test person, wearing immersion suit gloves, must be able to switch the light in its normal operational position on and off three times.

Acceptance Criteria

The light must function properly.

10.4.4 Corrosion and Seawater Resistance Test

Test Procedure

One unit shall be subjected to a corrosion and seawater resistance test according to IEC 945 :3rd edition (November 1996) paragraph 8.12.

(Note 1: If there are no exposed metal parts the Corrosion and Seawater Resistance Test need not be conducted.)

(Note 2: The Corrosion and Seawater Resistance Test may be waived where the manufacturer is able to produce evidence that the external metals employed will satisfy the test.)

Acceptance Criteria

There shall be no undue deterioration of metal parts and the unit shall function.

[10.4.5 not required for lifejacket lights]

10.4.6 Test for Oil Resistance

Test Procedure

One unit shall be subjected to the Oil Resistance test according to IEC 945 :3rd edition (November 1996) paragraph 8.11.

Acceptance Criteria

After this test the unit shall not be unduly affected by oil and shall show no sign of damage such as Shrinking, cracking, swelling, dissolution or change of mechanical qualities. Furthermore, the survival craft exterior light shall function after the test.

10.4.7 Rain Test, and Water-Tightness Test

Test Procedure

One unit shall be subjected to a rain test according to IEC 945 :3rd edition (November 1996) paragraph 8.8.

After having passed the rain test, the unit and the complete power source shall be immersed horizontally under not less than 300 mm of fresh water for at least 24 h.

Acceptance Criteria

The unit shall comply with the requirements of IEC 945 :3rd edition (November 1996) paragraph 8.8.2, and shall function after the rain test. Additionally, after the water-tightness test the unit shall function and there shall be no evidence of water inside the unit.

10.4.8 Fire Test

Test Procedure

One unit shall be subjected to a fire test. A test pan at least 30 cm x 35 cm x 6 cm shall be placed in an essentially draught-free area. Water shall be put in the bottom of the test pan to a depth of not less than 1 cm followed by enough petrol to make a minimum total depth of not less than 4 cm. The petrol shall then be ignited and allowed to burn freely for at least 30 s. The unit shall then be moved through the flames, facing them, with the unit's light not more than 25 cm above the top edge of the test pan so that the duration of exposure to the flames is at least 2 s.

Acceptance Criteria

The unit shall not sustain burning or continue melting after being totally enveloped in a fire for a period of at least 2 s and after being removed from the flames. Furthermore, the unit shall function after the test.

10.4.9 Measurement of Luminous Intensity

Test Procedure

If the voltage at five minutes of operation is lower than the recorded voltage at the end of life it is permissible to use a lamp from the same build standard for the light output test. Using the lowest recorded voltage a light output test can be carried out as described below. The voltage of the specified number of test units should be monitored continuously for the specified time. To make sure that all the test units provide a luminous intensity of not less than the specified luminous intensity in all directions of the upper hemisphere after the specified time of operation, the following test shall be performed.

It must be demonstrated to the satisfaction of the inspecting surveyor that at least one light from each of the specified temperature ranges that the required luminous intensity is achieved in all directions of the upper hemisphere using a photometer which is calibrated to the photometric standards of the appropriate National or State Standards Institute. (Note: CIE Publication No. 70 contains further information.) The lowest voltage light of the cold temperature test sample lot, the highest voltage light of the high temperature test sample lot and the mean voltage light of the ambient temperature sample lot should be selected. These three lights must be used for the light output tests. In the event that a lamp filament burns out during the light output test, a second light from the same performance test lot may be used.

Luminous intensity should be measured by a photometer directed at the centre of the light source with the test light on a rotating table. Luminous intensity should be measured in a horizontal direction at the level of the centre of the light source and continuously recorded through a 360 degree rotation. These measurements should be taken in the azimuth angles at 5 degree intervals above the horizon up to the single measurement at 90 degrees, (vertical). Luminous intensity should then be measured in a vertical direction, beginning at the centre of the light source at the point of lowest recorded light output, and continuously recorded through an arc of 180 degrees.

Acceptance Criteria

The test lights shall continue to provide a luminous intensity of not less than the specified intensity in all directions of the upper hemisphere for a period of at least the specified time. All measured data of luminous intensity and voltage shall be documented. In the case of a flashing light, it shall be established that the rate of flashing for the specified operating period is not less than 50 flashes and not more than 70 flashes per minute and that the effective luminous intensity is at least the minimum specified intensity in all directions of the upper hemisphere.

The effective luminous intensity is to be found from the formula:

$$\left[\frac{\int_{t_1}^{t_2} I dt}{0.2 + (t_2 - t_1)} \right]_{\text{avg}}$$

where: I is the instantaneous intensity,
0.2 is the Blondel-Rey constant, and
 t_1 and t_2 are time limits of integration in seconds

Note: Flashing lights with a flash duration of not less than 0.3 seconds, not including incandescence time, may be considered as fixed lights for the measurement of luminous intensity. Such lights shall provide the required luminous intensity in all directions of the upper hemisphere. (Incandescence time is the time interval between switch on and the luminous intensity reaching the required minimum luminous intensity.)¹

10.4.10 Chromaticity

Test Procedure

One unit shall be tested for chromaticity to determine that it lies within the boundaries of the area “white” of the diagram specified for each colour by the International Commission on Illumination, (CIE). The chromaticity of the light shall be measured by means of colorimetric measurement equipment which is calibrated to the appropriate National or State Standards Institute. (Note: CIE Publ. No. 15.2 contains further information.) Measurements on at least four points of the upper hemisphere shall be taken.

Acceptance Criteria

The measured chromaticity coordinates should fall within the boundaries of the area of the diagram, as per CIE.

The boundaries of the area for white lights are given by the following corner co-ordinates:

x	0.500	0.500	0.440	0.300	0.300	0.440
y	0.382	0.440	0.433	0.344	0.278	0.382

(Draft standard CIE DS 004.2/E-1996, Colours of Light Signals, with colour tables.)

¹ USCG Note: Test reports for flashing lights must include a measurement of the length of time that a flash exceeds 0.75 cd. This time must be at least 0.3 s to avoid a Blondel-Rey intensity analysis. Measurement of the voltage supplied to the lamp is not sufficient for this requirement because of the incandescence time of the bulb.